Fast Response Time of the Multi-Domain Vertical Alignment Liquid Crystal Mode using Band Separation UV Exposure Method

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Recently, LCD technologies is more required to improve the display performance including resolutions, response time, viewing angles and luminance, in order to overcome the competition with an organic light emitting diode (OLED) display. Especially, optical response time is one of the key factors because slow switching speed of LC molecules is able to induce motion blur and color breakup. In order to increase the optical response time of the LC cell, current studies are focused on the surface anchoring energy of the alignment layer because the anchoring energy on the surface of the polyimide (PI) layer strongly affects the dynamic behavior of LC molecules on surface [1, 2]. In case of a photo-alignment which is representative non-contact LC align method using UV exposure, however, the weak anchoring power of the PI layer can be shown, so the anchoring power in the photosensitive PI layer needs to be strong in order to achieve a fast response time which is a weak optical point compared with an OLED.

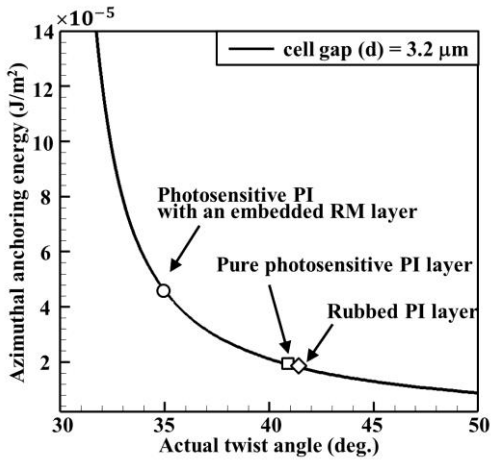

Figure 1. Comparison of the measured surface anchoring energy for three PI samples.

In this paper, we proposed the photo-alignment method with the strong surface anchoring energy by applying the two band UV exposure method on the photosensitive PI layer embedded with reactive mesogens (RMs) for achieving the fast response time properties of the multi-domain vertical alignment (VA) LC mode. Fundamentally, the photosensitive PI materials and the RM polymers were simultaneously polymerized using the conventional UV exposure method, because the bandgap of UV rays involved the absorption wavelength of UV rays for tow polymers. For this problem, we separated the wavelength of UV rays for the photo-polymerization (over 340 nm) and LC alignment process (at 254 nm) in this paper to avoid changing the chemical structure in photosensitive PI layer with embedded RMs when exposing it to the UV rays. As measured results of the surface anchoring energy in Fig. 1, we finally achieved the enhanced switching speed of LC molecules in multi-domain VA LC cell.

References

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